'PESA' LARGE RED DRY BEAN

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In much of sub-Saharan Africa, dry beans (*Phaseolus vulgaris* L.) provide a staple source of protein, carbohydrates, and some minerals and vitamins. In Tanzania, dry bean is an important subsistence and cash crop. Official yield figures for Tanzania are typically below 500 kg ha^{-1} whereas yield potential with agricultural inputs is up to 2,500 kg ha^{-1}. Yields remain low in part because of biotic and abiotic stresses (Wortmann et al., 1998). The Bean/Cowpea CRSP supported varietal development at Sokoine University of Agriculture (SUA) in Tanzania from 1981 to 2007. The program focused on yield stability, adaptation to low to mid altitude (<1000 masl) environments and disease resistance.

In eastern and southern Africa, large seeded types from the Andean center of domestication are preferred. Many seed colors are used, but among the most wide-spread are the reds as typified by landrace varieties such as 'Canadian Wonder', 'Bwana Shamba', and 'Kenya'. This type has a preferred broth color and is considered to be a highly marketable cash crop.

'Pesa' large red seeded dry bean is being released as a high yielding variety with a preferred seed color type for market and good cooking quality. Reflecting its cash crop status, the name Pesa means "money" in Swahili.

Origin: Released in 2006, Pesa was derived from 'Rojo' x 'Kablanketi' made in 1992-93. Rojo is a large red-seeded variety released by SUA in 1997. Rojo was derived from 'SUA 90' x 86EP5034-B, the latter of which has the pedigree [(Blue Mountain x NY76) x (Cornell49-242 x Montcalm)]. SUA 90 was developed at CIAT (accession number G5476; Hillocks et al., 2006) and distributed in Africa with the designation TMO 216. Blue Mountain is a snap bean released in 1983 (Silbernagel and Drake, 1983). 'Montcalm' is a dark red kidney bean released in 1974 by Michigan State University. Cornell 49-242 is a small black from Venezuela, and the origin of NY 76 is unknown. Kablanketi is a popular local landrace (see release notice for 'Mshindi', this issue, for more information).

The Rojo x Kablanketi was advanced through the F_1 and F_2 generations in 1993. In 1994, farmers evaluated seed and plant characters of about 1,000 F_3 progeny rows at the SUA Mifiga research farm (Michael Butler et al., 1995). The F_4 generation was advanced without farmer participation. In the F_5, 60 single plant derived progeny rows were again evaluated by farmers. Selected F_6, lines were placed in preliminary trials and 16 F_7 lines were evaluated in advanced trials. Eight F_8 lines were evaluated, and on-farm trials were initiated in 2001 and 2002. Advanced and on farm trials were repeated in 2005. Pesa was also tested in 2005 by the National Bean Program at the Selian Research Center in Arusha. On-farm trials were conducted in Msongozi and Maharaka Village in Morogoro rural district in 2001, 2002, 2005, and Dihinda Village in 2002, 2004, 2005 in Mvomero rural district.

Description: Pesa was previously tested under the experimental number EG 44. Pesa out-yielded 'Kenya' in nine of 12 trials and had an overall yield advantage of 109%. Yields were similar to SUA 90 with Pesa at 99% of 'SUA 90' and having higher yields in six of 15 trials. When compared to Rojo, Pesa yielded 91% of the check and had higher yields in 40% of trials. Overall yields were

similar in researcher's plots and on-farm trials. Yield over 15 environments averaged 978 kg ha^{-1} at the Mafiga and Selian sites and 424- 1934 kg ha^{-1} in farmers' fields at Msongozi, Maharaka and Dihinda.

Pesa averages 33 d to 50% flower and 78 d to 85% buckskin pods; similar to Kenya, SUA 90 and Rojo with 34, 32 and 33 d to 50% flower and 78, 78 and 77 d to maturity. Pesa has determinate bush (Type I) growth habit 44 cm in height. Flowers are pink but other plant parts lack anthocyanin. Pods average 13 cm long, 1 cm wide and contain four ovules on average.

Pesa seeds averaged 36.8 g·100 $seeds^{-1}$ compared to 36.4, 26.9 and 38.9 g·100 $seeds^{-1}$ for Kenya, Rojo, and SUA 90. Seed of Pesa are similar to Rojo, but shaped more spherically.

BCMV and BCMNV symptoms have never been observed on Pesa in field trials. Pesa was evaluated in 15 trials for reaction to ALS, 12 trials to CBB, and three trials to bean rust. Based on trials with moderate levels of disease, Pesa was moderately susceptible to ALS, and CBB. Rust infection was too light to determine resistance reaction.

Pesa cooks in 42 min as determined by Mattson cooker (Mattson, 1946) over gas and 108 min when cooked over charcoal (average of two villages). Kenya, SUA 90 and Rojo, had shorter times of 23, 29, and 28 min, respectively. Kenya had a shorter cooking time (98 min) over charcoal whereas Rojo and SUA 90 were longer (130 and 120 min, respectively).

Seventy-two farmers from Maharaka and Msongozi villages evaluated Pesa and check varieties at harvest for color of the dry seed, cooking time, broth and soup suitability, and taste. Fifty-two farmers evaluated marketability. Seventy-five percent found the color to be suitable or highly suitable. Cooking time was perceived as suitable or highly suitable by 81% of farmers. Broth suitability and taste were rated as suitable or better by 74 and 64% of farmers, respectively. Eighty-five percent of farmers thought that Pesa was suitable to highly suitable for market. Overall, farmers found Pesa to meet their criteria for a palatable variety with high potential marketability.

Availability: Pesa was approved for release by the Tanzania National Variety Release Committee with no restrictions on propagation and use. Small quantities of seed for research purposes are available from the bean breeding program at Sokoine University of Agriculture, Morogoro, Tanzania.

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